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1 Water Filter and Treatment System and Component

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3 The present invention relates to a water filter and  
4 treatment component for use in host water treatment  
5 apparatus, and a system therefor.

6

7 In the production of treated and/or purified water,  
8 for example ultra-pure water for laboratory use,  
9 several components are generally used in conjunction  
10 to provide the desired water quality. Some of these  
11 components may be used in parallel or in series, and  
12 some are more critical than others to the final  
13 water quality. Nevertheless, the full and correct  
14 performance of all the components is generally  
15 essential to guarantee the treated water quality.

16

17 To ensure that the final water quality is of the  
18 required standard, quality monitors are usually  
19 installed either within or external to the water  
20 purification unit to monitor key water parameters on  
21 an ongoing basis. Typically these will include, but  
22 are not limited to, resistivity, conductivity,

1 temperature, Total Organic Carbon (TOC), flow rate,  
2 etc.

3  
4 Notwithstanding the above monitoring, for certain  
5 applications, industry regulations require  
6 traceability of components that affect the final  
7 water quality. Typically, this information is  
8 required by companies producing pharmaceuticals or  
9 similar products. Currently, this is generally  
10 carried out by manual logging of component  
11 information.

12  
13 Meanwhile, components can often be installed and/or  
14 used in more than one position in a water treatment  
15 apparatus. In other situations, optimum performance  
16 of the apparatus can be obtained by using the  
17 components in different positions at different  
18 instances. However, incorrect performance and/or  
19 positioning cannot currently be prevented, which may  
20 seriously undermine the water quality and  
21 production.

22  
23 Additionally, it is a desire to know how much  
24 capacity or operational lifetime is retained within  
25 a component. However, as most components are sealed  
26 units, this is impossible to forecast before the  
27 component suddenly expires or breaks down, again  
28 potentially significantly affecting the water  
29 production. This may cause inconvenience to the  
30 user who would often prefer to schedule component  
31 changes at specific times.

32

1 It is an intention of the present invention to  
2 obviate the above disadvantages.

3  
4 Thus, according to one aspect of the present  
5 invention, there is provided a water treatment  
6 component for use in a host water treatment  
7 apparatus, wherein the component has an electronic  
8 circuit adapted to co-operate with an electronic  
9 circuit in the host apparatus. The host apparatus  
10 and separable water treatment component together  
11 comprise a water treatment system.

12  
13 The co-operation may be one way, either from  
14 component to host or vice versa, or two-way.

15  
16 The component circuit and host circuit can  
17 communicate via radio, infrared, or any other  
18 transmittable waveforms including optical and  
19 magnetic contact. Preferably, the circuits  
20 communicate by physical electrical contact for  
21 maximum robustness of connection, and to minimise  
22 interference by other means of communication.  
23 Preferably co-operation of the circuits is only  
24 possible when the communication is correctly  
25 created, and this is only achieved when the  
26 component is correctly installed and/or fitted with  
27 the host apparatus.

28  
29 Each electronic circuit preferably includes a memory  
30 capacity and a capability to read/interrogate the  
31 other electrical circuit. The electrical circuit in  
32 the host apparatus preferably includes a central

1 processor, and the electrical circuit in the  
2 component preferably includes or is a data chip,  
3 e.g. a microchip such as well known in the art.  
4 The electronic circuit of the component is  
5 preferably integral with the component, and more  
6 preferably, is formed integrally with the component  
7 during the component manufacture. The electronic  
8 circuit is preferably embedded into or mounted onto  
9 the component.

10

11 The electronic circuit of the component preferably  
12 includes a database having relevant data relating to  
13 that component such as validation information,  
14 process information, and/or manufacturing  
15 information. Typical information includes, but is  
16 not limited to, date of manufacture, date of  
17 testing, operator, cartridge type, media type(s),  
18 media volumes, media lot numbers, quality control  
19 details, and possibly a unique reference code.

20

21 The data of the component electronic circuit could  
22 be encrypted.

23

24 According to one embodiment of the present  
25 invention, the electronic circuit of the component  
26 provides an enablement signal to the electronic  
27 circuit of the host apparatus, and/or vice versa.

28

29 The enablement signal may include means for the  
30 component or host to control the other part.  
31 Preferably, the component and host inter-co-operate.

32

1 Information that can be communicated between the  
2 electronic circuits of the component and host  
3 generally include validation information, production  
4 information and/or manufacturing information. Such  
5 information in the component could be accessed from  
6 the component and be displayed by the host  
7 apparatus.

8  
9 If necessary or desired, the same information in the  
10 system could be accessed via a separate reader  
11 device or otherwise communicated to a remote reader,  
12 for analysis and/or display.

13  
14 In typical operation, the electronic circuit of the  
15 component includes at least a data tag, and the  
16 presence of the data tag is identified by the  
17 electronic circuit of the host apparatus upon  
18 correct fitment and/or installation of the  
19 component, which creates a two-way communication  
20 protocol. The host apparatus can then upload  
21 relevant data from the data tag, etc. and the  
22 component's circuit can download the relevant  
23 information from the host apparatus.

24  
25 In another embodiment of the present invention, lack  
26 of co-operation between the electronic circuit of  
27 the component and electronic circuit of the host  
28 apparatus indicates the incorrect fitment and/or  
29 installation of the component with the host  
30 apparatus, or incorrect location of a component on a  
31 host apparatus where more than one location is  
32 possible.

1 In another embodiment of the present invention, the  
2 lack of co-operation between the electronic circuit  
3 of the component and the electronic circuit of the  
4 host apparatus identifies incorrect operation of the  
5 component and/or host apparatus, e.g. a water leak.

6  
7 The present invention extends to a water treatment  
8 component as hereinbefore defined useable with a  
9 host water treatment apparatus having a  
10 co-operable electronic circuit, as well as a host  
11 water treatment apparatus useable with a water  
12 treatment component as hereinbefore defined, as well  
13 as their co-operation to provide a water treatment  
14 system. The electronic circuits of the component  
15 and host apparatus can co-operate in a manner as  
16 hereinbefore described.

17  
18 In a further embodiment of the present invention the  
19 water treatment component of the present invention  
20 is a consumable and/or replacement unit such as a  
21 cartridge. This includes water treatment units  
22 containing ion exchange resins, filters, media, etc.

23  
24 According to a yet further embodiment of the present  
25 invention, a similar treatment component useable  
26 with the host apparatus of the present invention is  
27 an operational unit. Such operational units include  
28 means to sanitise and/or clean e.g. by way of  
29 disinfection and/or chemical cleaning, one or more  
30 parts of the host apparatus. This may be by means  
31 of a component that contains the sanitant or by the

1 fitment of dummy components in place of components  
2 that may be damaged by the sanitant.

3  
4 The present invention provides the benefits of  
5 electrical co-operation and data tagging. These  
6 include one or more of correct  
7 installation/fitting/use of components, correct  
8 location of relevant components in a host apparatus,  
9 error-free transfer of information of component  
10 origins and/or history, automatic start and/or use  
11 of components such as sanitisation units, and  
12 prevention of incorrect components, such as half-  
13 used components, and out of date or inappropriate  
14 components.

15  
16 An embodiment of the present invention will now be  
17 described by way of example only, and with reference  
18 to the accompanying and diagrammatic Fig. 1 showing  
19 a water treatment component and host water treatment  
20 apparatus according to one embodiment of the present  
21 invention.

22  
23 Referring to Fig. 1, there is shown a first water  
24 treatment component 2 and a host water treatment  
25 apparatus 4. The host apparatus 4 has two component  
26 locations, one shown ready to receive the first  
27 component 2, and one shown fitted with a second  
28 component 22.

29  
30 The component 2 has an embedded microchip 6, which  
31 can co-operate with an electronic interface 8 on the  
32 host apparatus 4. The remaining part of the

1 electronic circuitry in the host apparatus 4 is not  
2 shown.

3

4 The component 2 includes inlet and outlet water  
5 ports 10a,12a, to fit with complementary inlet and  
6 outlet water ports 10b,12b on the host apparatus.

7

8 The host apparatus includes a purified water outlet  
9 14, and an electronic display 16.

10

11 The host apparatus 4 is a water purification unit,  
12 and the component 2 is a consumable resin cartridge.

13

14 The microchip 6 includes a database retaining  
15 product master records including date of manufacture  
16 of the component 2, date of testing, operator,  
17 cartridge type, media type (within the component),  
18 media volume, media lot numbers, quality control  
19 details, and a unique reference code. Only the  
20 correct installation and fitting of the component 2  
21 within the opening in the host apparatus 4, allows  
22 the microchip 6 to engage and co-operate with the  
23 interface 8 on the host unit 4.

24

25 Once the component 2 is fitted correctly, the  
26 electronic circuitry in the host apparatus  
27 identifies the presence of a data tag on the  
28 component 2, such that a two-way communication  
29 protocol is established. Once communication has  
30 been made, the host apparatus 4 can upload relevant  
31 data from the microchip data tag 6, and the micro  
32 chip data tag 6 can download relevant information



1 from the host apparatus 4. The information uploaded  
2 to the host apparatus includes performance  
3 validation criteria such as lot numbers, dates and  
4 content type and property. Information which is  
5 downloaded into the microchip data tag 6 includes  
6 date of commencement of operation and volume of  
7 water used on an ongoing basis. The combination of  
8 this information allows improvement in determination  
9 of consumable lifetime.

10

11 Some or all of this information could be displayed  
12 on the display 16 on the host apparatus 4. This  
13 could include visual warning of any incorrect  
14 operation, or end of life-time of the component 2.

15

16 Because the host apparatus electronic circuitry can  
17 identify the presence, or not, of a data tag, it can  
18 be used to prevent leaks from the apparatus 4, in  
19 that if a component is not fitted correctly with its  
20 data tag in place, then the apparatus 4 will not  
21 operate and thus prevent leaks occurring.

22

23 Moreover, if the component 2 could be fitted in more  
24 than one opening in the host apparatus 4, incorrect  
25 fitment of the component 2 in the wrong position  
26 could be prevented due to the unique identifier code  
27 on each data tag. In this regard, Figure 1 shows a  
28 second separable water treatment component 22. This  
29 may provide the same function as the first component  
30 2, or different. If different, an attempt to fit  
31 the first component 2 into the location of the  
32 second component 22 may provide an error signal or

1 sign through the display 16, thus ensuring that the  
2 host apparatus 4 is not compromised.

3

4 The memory in the host apparatus electronic  
5 circuitry could also detect if a particular data tag  
6 has been previously used in a particular position,  
7 and hence also prevent a situation where optimum  
8 performance is not obtained. Furthermore, if  
9 certain changes to the configuration of components  
10 is required prior to carrying out such functions as  
11 sanitisation then this configuration can be  
12 ascertained prior to entering that mode.

13

14 The present provides a number of clear advantages,  
15 including increased automation of information  
16 logging, prevention of use of components in an  
17 un-optimised manner, greater user awareness of  
18 remaining operational life time of components, and  
19 prevention of mis-connection/mis-installation which  
20 could compromise final water quality, etc.